

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant :	Javit A. Drake et al.	Art Unit :	1745
Serial No. :	10/664,822	Examiner :	Robert W. Hodge
Filed :	September 16, 2003	Conf. No. :	3431
Title :	ENHANCED FUEL DELIVERY FOR DIRECT METHANOL FUEL CELLS		

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APPEAL BRIEF ON BEHALF OF JAVIT A. DRAKE ET AL.

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(1) Real Party in Interest

The real party in interest is The Gillette Company, Prudential Tower Building, Boston MA. The Gillette Company was acquired by The Procter & Gamble Company in 2005.

(2) Related Appeals and Interferences

The appellant is not aware of any appeals or interferences related to the above-identified patent application.

(3) Status of Claims

This is an appeal from the decision of the Primary Examiner in an office action dated February 3, 2009, finally rejecting claims 1-33 all of the claims remaining under consideration in the application. Claims 34-39 were previously withdrawn from consideration.

A response to the final office action was filed where, *inter alia*, claims 1-10 were canceled. Appellant was informed, via an advisory action, that the amendments were entered for the purposes of appeal. Appellant filed a Notice of Appeal on **March 13, 2009**.

Claims 11-33 are the subject of this appeal.

(4) Status of Amendments

Appellant filed a Reply to the Final Office Action. In an advisory action dated March 2, 2009, the Examiner indicated that the Reply would be entered. All previously filed amendments have been entered.

(5) Summary of Claimed Subject Matter

Claim 11

Appellant's claim 11 is directed to a fuel cell cartridge that includes a housing and a fuel egress port. "*Referring to FIGS. 2A-2C, a fuel cartridge 12 has a fuel delivery interface, that is complementary to the interconnect 16 (FIG. 1), including an egress port 32, as shown.*"¹

¹ Appellant's Specification, Page 5, lines 8-9

Inventive features of Appellant's claim 11 include a composite membrane residing in the housing of the fuel cartridge. *"Referring to FIG. 2B, a multilayer membrane 48 includes a series of layers 48a or folds of polymer membrane disposed about a periphery of the cartridge 12 to increase membrane surface area."*² The composite membrane includes a porous substrate, a polymer membrane disposed over a first surface of the porous substrate *"An example of the multilayer membrane 48 as wound-cell includes vaporization membrane 48a disposed over a first surface of a substrate 48b of porous material that holds methanol in a liquid state within pores of the material to enable the liquid methanol to migrate to the membrane 48a and convert to a vapor phase."*³ and a coating of a methanol-impermeable material disposed over an opposite surface of the substrate. *"An opposite surface of the sponge material 46b is coated with a methanol-impermeable layer 48c, which can be fabricated from materials such as a cross-linked rubber, a polymer/inorganic composite, a surface treated material such as surface fluorinated high density polyethylene, or other methanol-impermeable material."*⁴

Claim 24

Appellant's claim 24 is directed to a composite membrane that includes a porous substrate, a polymer membrane disposed over a first surface of the porous substrate and a coating of a methanol-impermeable material disposed over an opposite surface of the substrate. Claim 24 is supported in the same manner as the analogous features of claim 11.

(6) Grounds of Rejection to be Reviewed on Appeal

1. Claims 11-20, 22-30, 32 and 33 stand rejected under 35 U.S.C. 103(a) as being obvious over Hockaday (U.S. Patent No. 6,645,651) in view of Kaschemekat (U.S. Patent No. 5,069,793).

² Appellant's Specification, Page 6, lines 23-25

³ *Id.*, Page 6, lines 25-28

⁴ *Id.*, Page 7, lines 10-13

2. Claims 21 and 31 stand rejected under 35 U.S.C. 103(a) as being obvious over Hockaday in view of Kaschemekat and further in view of Wohlstadter (U.S. Patent no. 6,207,369).

(7) **Argument**

Obviousness

"It is well established that the burden is on the PTO to establish a prima facie showing of obviousness, *In re Fritsch*, 972 F.2d 1260, 23 U.S.P.Q.2d 1780 (C.C.P.A., 1972)."

In *KSR Intl. Co. v. Teleflex Inc.*, 127 S.Ct. 1727 (2007), the Supreme Court reversed a decision by the Court of Appeals for the Federal Circuit decision that reversed a summary judgment of obviousness on the ground that the district court had not adequately identified a motivation to combine two prior art references. The invention was a combination of a prior art repositionable gas pedal, with prior art electronic (rather than mechanical cable) gas pedal position sensing. The Court first rejected the "rigid" teaching suggestion motivation (TSM) requirement applied by the Federal Circuit, since the Court's obviousness decisions had all advocated a "flexible" and "functional" approach that cautioned against "granting a patent based on the combination of elements found in the prior art."

In *KSR* the Supreme Court even while stating that: "the Court of Appeals drew the wrong conclusion from the risk of courts and patent examiners falling prey to hindsight bias," warned that: "a factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning."

The Court of Appeals, finally, drew the wrong conclusion from the risk of courts and patent examiners falling prey to hindsight bias. A factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning. See *Graham*, 383 U. S., at 36 (warning against a "temptation to read into the prior art the teachings of the invention in issue" and instructing courts to "'guard against slipping into the use of hindsight'" (quoting *Monroe Auto Equipment Co. v. Heckethorn Mfg. & Supply Co.*, 332 F. 2d 406, 412 (CA6 1964)). Rigid preventative rules that deny factfinders recourse to common sense, however, are neither necessary under our case law nor consistent with it.

With respect to the genesis of the TSM requirement, the Court noted that although "As is clear from cases such as *Adams*⁵, a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known."

"The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification." *In re Gordon*, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

Although the Commissioner suggests that [the structure in the primary prior art reference] could readily be modified to form the [claimed] structure, "[t]he mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification." *In re Laskowski*, 10 U.S.P.Q. 2d 1397, 1398 (Fed. Cir. 1989).

"The claimed invention must be considered as a whole, and the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination." *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick*, 221 U.S.P.Q. 481, 488 (Fed. Cir. 1984).

Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under Section 103, teachings of references can be combined only if there is some suggestion or incentive to do so. *ACS Hospital Systems, Inc. v.*

⁵ *United States v. Adams*, 383 U. S. 39, 40 (1966)

Montefiore Hospital, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984)
(emphasis in original, footnotes omitted).

"The critical inquiry is whether 'there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.'" *Fromson v. Advance Offset Plate, Inc.*, 225 U.S.P.Q. 26, 31 (Fed. Cir. 1985).

**(1) Claims 11-20, 22-30, 32 and 33 are allowable
over Hockaday combined with Kaschemekat**

Claims 11, 13 and 15-20

For the purposes of this appeal only claims 11, 13 and 15-20 stand or fall together. Claim 11 is representative of this group of claims.

Claim 11 is directed to a fuel cartridge including a composite membrane residing in the housing of the fuel cartridge. The composite membrane includes a porous substrate, a polymer membrane disposed over a first surface of the porous substrate and a coating of a methanol-impermeable material disposed over an opposite surface of the substrate.

The combination of Hockaday and Kaschemekat fails to disclose or render obvious at least the foregoing features of claim 11. The examiner stated⁶:

Hockaday does not teach that the composite membrane has a coating of a methanol-impermeable material on one surface.

Kaschemekat teaches a spirally wound multi layer composite membrane comprising a porous substrate (i.e. web), a membrane disposed on a first surface of the substrate (i.e. microporous substrate membrane) and a coating that is a permselective polymer on the other surface of the substrate and said multi layer composite membrane can be a plurality of membranes (column 1, lines 11-52, column 10, lines 33-64 and example 1). Kaschemekat further teaches that different polymers can be chosen for their specific selectivity.

Appellant disagrees and contends that the combination of Hockaday with Kaschemekat neither describes nor suggests a composite membrane including "a coating of a methanol-impermeable material disposed over an opposite surface of a substrate." The examiner admits

⁶ Office Action dated 02/03/2009, Page 5

that: "Hockaday does not teach that the composite membrane has a coating of a methanol-impermeable material on one surface" and relies on Kaschemekat to allegedly teach this feature. Kaschemekat, in stark contrast, requires all layers of the membrane to be methanol permeable in order to function. The membrane in Kaschemekat has a feed side and a permeate side⁷. A liquid mixture fuel is in contact with the feed side of the membrane. The liquid fuel *passes through* the membrane and is removed in vapor form from the permeate side "One or more of the feed liquid components pass through the membrane and are withdrawn in vapor form on the permeate side."⁸

Kaschemekat also discloses that: "Glue is used to seal the ends and edges of the module, and to ensure that there is no vapor-transferring communication between the feed and the permeate sides of the membrane, except through the membrane."⁹ This teaching clearly ensures that there is no vapor transfer between the two sides of the membrane. Therefore there is not any vapor transfer, except *through* the layers that comprise the membrane, clearly proving that a methanol impermeable coating is not inherent in nor necessarily present in the combination of Hockaday and Kaschemekat.

Therefore, both sides of the membrane described in Kaschemekat are required to be permeable to the fuel either in a liquid or a vapor state. The membrane of Kaschemekat achieves permeate flow throughput¹⁰ while the composite membrane of the present application holds methanol within pores of the substrate.¹¹

Modifying Kaschemekat with a methanol impermeable layer is not a matter of obvious design choice, as contended by the Examiner, at least because Kaschemekat has no such teachings. Rather, that teaching is only gleaned from Applicant's claims and/or specification and it thus an example of improper hindsight reconstruction specifically cautioned against by the court in *KSR*.

The Examiner further alleges that¹²:

⁷ Kaschemekat, Col. 11, lines 40-42.

⁸ *Id.*, Col. 4, lines 40-42.

⁹ *Id.*, Col. 11, lines 38-42.

¹⁰ *Id.*, Abstract

¹¹ Appellant's Specification, Page 6, Lines 25-28

¹² Office Action dated 02/03/2009, Page 6

It would have also been obvious to use polyurethane for the membrane in Hockaday as taught by Kaschemekat in order to provide a membrane that is properly selected for its specific chemical selectivity and also since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

Assuming *arguendo* that one of ordinary skill combines Kaschemekat with Hockaday, Appellant contends that such a combination would not result in Appellant's claimed features, but instead would merely position Kaschemekat's composite membrane within the fuel ampoule of Hockaday and would offer no basis to modify Kaschemekat's composite membrane to include a methanol impermeable layer, as in Appellant's claim 11.

"The mere fact that a worker in the art could rearrange the parts of the reference device to meet the terms of the claims on appeal is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation or reason for the worker in the art, without the benefit of appellant's specification, to make the necessary changes in the reference device." *Ex parte Chicago Rawhide Mfg. Co.*, 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984).

Appellant contends that the examiner relies on this dubious principle of "design choice" precisely because the examiner is unable to find any teaching in the prior art that satisfies the language of claim 11, namely "a composite membrane residing in the housing of the fuel cartridge comprising a coating of a methanol-impermeable material disposed over an opposite surface of the substrate."

In the Advisory Action¹³ the Examiner alleged that Appellant has failed to show evidence that all layers of Kaschemekat are in fact permeable to methanol. The Examiner states¹⁴:

**Furthermore the burden was shifted to applicants to prove with evidence not arguments that the material of the prior art is not methanol impermeable, said burden has not been met. Conclusory statements are not probative unless supported by facts....
Applicants provide passages for supposed support that the layer of Kaschemekat is "methanol" permeable, however none of the cited passages state anything regarding "methanol". Furthermore Hockaday is the**

¹³ dated 03/02/2009

¹⁴ *Id.*, Page 2

primary reference which as already discussed in the grounds of rejection contains a methanol-impermeable coating.

The cited portions^{6,7} from Kaschemekat clearly show that the operating principles of the membrane in Kaschemekat require the membrane to be permeable to the liquid fuel being used. Therefore, assuming *arguendo* that it would be suggested to combine the membrane of Kaschemekat with Hockaday, as the Examiner urges, in a source of fuel to a direct methanol fuel cell, the membrane would in fact have to be permeable to the fuel, i.e., methanol. Any other conclusion would be a still further, unsupported and illogical modification of the secondary reference Kaschemekat to completely change the principle of operation of Kaschemekat.

Moreover, the fact that Hockaday describes a methanol impermeable coating for the storage container provides no motivation to modify the membrane, as described by Kaschemekat to include a methanol impermeable coating on the membrane. This is a clear example of *ex post* reasoning, and improper hindsight reconstruction that is based on entirely on Appellant's claims and/or specification, where Appellant's limits his claim to a methanol impermeable coating and the Examiner picks an unrelated feature of the primary reference to modify the secondary reference which is then used to modify the primary reference. Given all of the inferences made by the Examiner in arriving at the basis for the rejection, it is reasonable to conclude that the references as a whole when taken together do not suggest the claimed combination.

Claims 12 and 25

For the purposes of this appeal only claims 12 and 25 stand or fall together. Claim 12 is representative of this group of claims.

Claim 12 further distinguishes over the combination of Hockaday and Kaschemekat at least because the combination fails to describe or suggest a substrate in the composite membrane that is "provided to hold methanol in a liquid state within the porous material to enable liquid methanol to migrate to the polymer membrane and convert to a vapor phase."

The composite membrane, as described by Kaschemekat separates liquid and vapor phases of one or more feed liquid components, but is not configured to hold liquid methanol within the membrane.

Claims 22 and 32

For the purposes of this appeal only claims 22 and 32 stand or fall together. Claim 22 is representative of this group of claims.

Claim 22 distinguishes over a combination of Hockaday and Kaschemekat at least because the combination fails to describe or suggest a composite membrane with a coating of a methanol impermeable material "...wherein the methanol-impermeable coating is a cross-linked rubber, a polymer/inorganic composite, a surface fluorinated high density polyethylene, or other methanol-impermeable material."

Hockaday neither describes nor suggests a composite membrane, as claimed by Appellant. As shown above, the membrane described in Kaschemekat does not have a methanol impermeable coating. Hockaday provides no motivation to modify the membrane, as described by Kaschemekat, to include a methanol impermeable coating of a cross-linked rubber, a polymer/inorganic composite, a surface fluorinated high density polyethylene, or other methanol-impermeable material at least because the feature in Hockaday used by the examiner to modify the secondary reference Kaschemekat, is unrelated to the composite membrane. Therefore, the examiner's basis for using the materials of the walls of the container is merely further evidence of *ex post* reasoning on the part of the examiner.

Claims 23 and 33

For the purposes of this appeal only claims 23 and 33 stand or fall together. Claim 23 is representative of this group of claims.

Claim 23 distinguishes over a combination of Hockaday and Kaschemekat at least because the combination fails to describe or suggest a composite membrane "...wherein the substrate is polyethylene, polypropylene, nylon, polyurethane, or other analogous polymers or composites of one or more of these polymers"

The Examiner views the support web of Kaschemekat to be the substrate, as described in the present application¹⁵ stating: "**Kaschemekat teaches a spirally wound multi layer composite**

¹⁵ Office Action dated 02/03/2009, page 5

membrane comprising a porous substrate (i.e. web)...” Kaschemekat, however, provides no teaching that the support web could be made of polyethylene, polypropylene, nylon, polyurethane, or other analogous polymers or composites of one or more of these polymers. Rather, Kaschemekat clearly describes the support web to be non-woven polyester¹⁶: “A multilayer composite membrane was prepared by casting an asymmetric membrane on a support web of non-woven polyester.”

Claims 24 and 26-31

For the purposes of this appeal only claims 24 and 26-31 stand or fall together. Claim 24 is representative of this group of claims.

Claim 24 is directed towards a composite membrane and includes the features of: “... a porous substrate, a polymer membrane disposed over a first surface of the porous substrate and a coating of a methanol-impermeable material disposed over an opposite surface of the substrate.”

As discussed above, the composite membrane, as claimed is distinct over the alleged combination of references. Indeed, the examiner cannot show that the feature of the methanol impermeable coating is gleaned from either the secondary reference. Rather, the examiner is forced to modify the secondary reference, using a totally unrelated feature from the primary reference, the walls of the container, in order to find support for a coating of a methanol-impermeable material. The examiner modifies the secondary reference with this selective teaching to fashion a new composite membrane that functions in a different manner than described in the secondary reference. Appellant contends that this is a clear example of *ex post* reasoning made possible only Appellant's claims and specification.

¹⁶ Kaschemekat, Col. 12, lines 47-49

**(2) Claims 21 and 31 are not obvious over
Hockaday in view of Kaschemekat and further
in view of Wohlstadter**

Claims 21 and 31 limit the membrane to be comprised of a sintered metal disc coated with a polymer. At least for the reasons given for claim 11, these claims are also patentable over the alleged combination of Hockaday, Kaschemekat and Wohlstadter.

Conclusion

Appellant submits that claims 11-33 are allowable over the art in view of the arguments set forth above. Therefore, the Examiner erred in rejecting Appellant's claims and should be reversed.

Respectfully submitted,

Date: April 13, 2009

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Appendix of Claims

Claims 1-10 are canceled.

11. A fuel cartridge that supplies a source of fuel to a direct methanol fuel cell, the fuel cartridge comprising:

a housing;

a fuel egress port supported by the housing; and

a composite membrane residing in the housing of the fuel cartridge comprising:

a porous substrate;

a polymer membrane disposed over a first surface of the porous substrate; and

a coating of a methanol-impermeable material disposed over an opposite surface of the substrate.

12. The fuel cartridge of claim 11 wherein substrate is provided to hold methanol in a liquid state within the porous material to enable liquid methanol to migrate to the polymer membrane and convert to a vapor phase.

13. The fuel cartridge of claim 11 wherein the composite membrane is wound into a cylindrical shaped element.

14. The fuel cartridge of claim 11 wherein gaps between the polymer membrane and the methanol-impermeable coating providing a path for transporting a high flux of methanol vapor to the egress port.

15. The fuel cartridge of claim 11 wherein a plurality of the composite membranes are disposed in the fuel cartridge.

16. The fuel cartridge of claim 11 wherein a plurality of the composite membranes are disposed in the fuel cartridge and wound into a cylindrical shaped element.

17. The fuel cartridge of claim 11 wherein the substrate is polyethylene, polypropylene, nylon, polyurethane, or other analogous polymers or composites of one or more of these polymers.

18. The fuel cartridge of claim 11 wherein the polymer membrane is a polyurethane material.

19. The fuel cartridge of claim 11 wherein the polymer material is selected from the group consisting of polyurethanes, silicones, poly(trimethylsilyl-propyne), polymeric compositions, and composites.

20. The fuel cartridge of claim 18 wherein the polymer has a microporosity characteristic to govern vaporization.

21. The fuel cartridge of claim 11 wherein the membrane is a sintered metal disc coated with a polymer.

22. The fuel cartridge of claim 11 wherein the methanol-impermeable coating is a cross-linked rubber, a polymer/inorganic composite, a surface fluorinated high density polyethylene, or other methanol-impermeable material.

23. The fuel cartridge of claim 11 wherein the substrate is polyethylene, polypropylene, nylon, polyurethane, or other analogous polymers or composites of one or more of these polymers; the polymer membrane is a polyurethane, a silicone, poly(trimethylsilyl-propyne), or composites of polyurethanes, silicones, poly(trimethylsilyl-propyne) and the

methanol-impermeable coating is a cross-linked rubber, a polymer/inorganic composite, a surface treated material such as surface fluorinated high density polyethylene, or other methanol-impermeable material.

24. A composite membrane comprising:
a porous substrate;
a polymer membrane disposed over a first surface of the porous substrate; and
a coating of a methanol-impermeable material disposed over an opposite surface of the substrate.
25. The membrane of claim 24 wherein substrate is provided to hold methanol in a liquid state within the porous material to enable liquid methanol to migrate to the polymer membrane and convert to a vapor phase.
26. The membrane of claim 24 wherein the composite membrane is wound into a cylindrical shaped element.
27. The membrane of claim 24 wherein gaps between the polymer membrane and the methanol-impermeable coating providing a path for transporting a high flux of methanol vapor.
28. The membrane of claim 24 wherein the substrate is polyethylene, polypropylene, nylon, polyurethane, or other analogous polymers or composites of one or more of these polymers.
29. The membrane of claim 24 wherein the polymer material is selected from the group consisting of polyurethanes, silicones, poly(trimethylsilyl-propyne), polymeric compositions, and composites.

30. The membrane of claim 24 wherein the polymer has a microporosity characteristic to govern vaporization.

31. The membrane of claim 24 wherein the membrane is a sintered metal disc, coated with a polymer.

32. The membrane of claim 24 wherein the methanol-impermeable coating is a cross-linked rubber, a polymer/inorganic composite, a surface fluorinated high density polyethylene, or other methanol-impermeable material.

33. The membrane of claim 24 wherein the substrate is polyethylene, polypropylene, nylon, polyurethane, or other analogous polymers or composites of one or more of these polymers; the polymer membrane is polyurethanes, silicones, poly(trimethylsilyl-propyne), or composites of polyurethanes, silicones, poly(trimethylsilyl-propyne) and the methanol-impermeable coating is a cross-linked rubber, a polymer/inorganic composite, a surface treated fluorinated high density polyethylene.

Claims 34-39 are withdrawn.

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Evidence Appendix

None

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Related Proceedings Appendix

None